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Chapter 2

SIRREX-7 Instrumentation

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ABSTRACT

The highest priority for the instrumentation used for SIRREX-7 was to bring together as wide a diversity of equipment used in the laboratory calibration and field measurement process as possible, so the agreed upon minimum number of replicates for a particular equipment type was three. Each participating group contributed more than one example of a particular equipment type, which ensured equipment with a wide range of ages, calibration histories, sensitivities, flux levels, etc. Equipment that was used as part of the digitization or control process, like voltmeters and shunts, were calibrated as close to the SIRREX-7 activity as possible; all other types of equipment were reviewed to ensure their calibration histories were within the guidelines prescribed by the manufacturer or the protocols governing their use (like lamps and plaques). In some cases, equipment that did not meet the recency of calibration requirements were used, so the effect of ignoring this practice (regardless of the reason) could be quantified. In addition, some equipment with known problems were included to see if the outer range of variance in the results was defined by substandard equipment or if other factors (like operator error) were more important.

2.1 INTRODUCTION

The equipment used during SIRREX-7 was representative of the instrumentation used on a regular basis by the ocean color community either for laboratory calibration or field measurements. Although several manufacturers were not represented in the suite of instruments used, the functionality of the missing devices was represented, so individual groups using nonrepresentative equipment can still derive lessons and conclusions from SIRREX-7. With a small number of participants, it was not feasible to accept the added complexity of differing instruments; by using predominantly one manufacturer, it was possible to maximize the number of experiments or the number of replicate samplings within an experiment over the relatively short time period of the activity.

2.2 LAMPS

Many laboratories base their absolute calibrations of irradiance and radiance responsivities on the NIST scale of spectral irradiance, which is available to the wider community through calibrated tungsten-halogen FEL lamps (Walker et al. 1987). Some laboratories acquire a calibrated FEL lamp standard of spectral irradiance directly

from NIST, but more typically, a laboratory bases its irradiance scale on a lamp which was calibrated and certified as traceable to the NIST scale by a commercial standardizing laboratory. The former are usually referred to as *secondary* standards, and the latter as *tertiary* standards. In some cases, a laboratory will purchase additional seasoned, but uncalibrated lamps, and transfer the spectral irradiance scale from their primary calibrated lamp using a transfer radiometer (the JRC was experimenting with this approach using L005). The use of less expensive standards for calibration experiments is a common practice in most cases, because it avoids a shortening in the useful lifetime of the primary reference lamp. One of the questions addressed here is what extra uncertainty is associated with this cost-effective practice.

Another type of lamp is the so-called *working lamp*. This lamp is used for illumination requirements in keeping with FEL light levels wherein it would not be prudent or cost effective to reduce the lifetime of a standard lamp. Detailed information about the standard and working lamps used during SIRREX-7 is presented in Table 5. The former are indicated by the “L” codes and the latter by the “W” codes.